SCB-100

Electronic Services - Hayward, Ca
M17130X

MULTI-AMP®
BIDDLE™
MEGGER®

Biddle Part# 11756
SCB-100

Electrical Test Equipment
Measuring Instruments
Testing and
Training Services

GE Rental/Lease
Rental Accessory
Failure to return this item will result in a minimum charge of $100.00
1-800-GE-RENTS
GE-11

AVO™
AVO INTERNATIONAL

SC 3-100

multi-amp CORPORATION

4271 Bronze Way Dallas, Texas 75237-1088 U.S.A.
Ph. (214) 333-3201 Telex 163548 MULAM DL Fax (214) 333-3533

Multi-Amp Canada, 445 Finchdene Square, Scarborough, Ontario, M1X 1B7
Ph. (416) 298-6770 Telex 065-25453 Fax (416) 298-7214

INSTRUCTION MANUAL

For

STATIC TRIP UNIT TEST SET

MODEL SCB-100

SERIAL NO._____

It is essential that this instruction book be read thoroughly before putting the equipment in service.

P/N 11756
Rev. 1 8/2/91

IMPORTANT

The information and data contained within this instruction manual are proprietary with MULTI-AMP Corporation. The equipment described herein may be protected by one or more U.S. letters patent. MULTI-AMP specifically reserves to itself all rights to such proprietary information as well as all rights under any such patent, none of which is waived by the submission of this instruction manual to anyone.

The recipient, if a Government agency, acknowledges that this instruction book and the equipment described were procured with "Limited Rights" to technical data as described in ASPR 9-203 (b).

Copyright MULTI-AMP Corporation, 1984, 1985, 1989, 1991

P/N 11756
Rev. 1 8/2/91

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_09885

TABLE OF CONTENTS

SECTION			PAGE
I.	General Description		1
II.	Theory of Operation		3
III.	Standard Test Procedures		5
	A.	Allis Chalmers Static Trip Device Tests - First Generation	5
		1. Description of Tests	5
		2. Test Procedure	6
		3. Trip Signal Test	6
		4. Long Delay Pickup	7
		5. Long Delay Time	9
		6. Instantaneous	10
		7. Power Supply Test	10
		8. Transfer Test	11
		9. General Notes and Comments	11
	B.	Allis Chalmers Trip II Static Trip Devices	12
		1. Testing with the Static Trip on the Breaker	12
		2. Connections	12
		3. Long Delay Pickup	12
		4. Long Delay Time	13
		5. Short Delay Pickup	14
		6. Short Delay Time	16
		7. Instantaneous	16
		8. Ground Delay Pickup	17
		9. Ground Delay Time	17
	C.	Bench Testing Static Trip II Devices Connections	18
		1. Bench Test Procedures	19

	2.	General Notes	19
	3.	Repair of Static Trip Devices	20
	4.	Testing the Trip Actuator	20
	5.	Testing with the Actuator on the Breaker	21
	6.	Bench testing actuators	21
	7.	Testing the Tripping Transformers	22
	8.	Test preparations	22
	9.	Continuity Test	22
	10.	Exciting Current Test	23
	11.	Connections	24
	12.	Test Procedure	24
D.		Westinghouse System Circuit Breaker	25
		SCB Series	25
	1.	Field Test Procedure	25
	2.	Description of Tests	25
	3.	Test Procedure	26
	4.	Long Delay Pickup	26
	5.	Long Delay Time	27
	6.	Short Delay Pickup	27
	7.	Short Delay Time	27
	8.	Instantaneous	28
	9.	Ground Delay Pickup	28
E.		Westinghouse Amptector Solid State Trip Units	29
	1.	Long Delay Pickup	29
	2.	Long Delay Time	29
	3.	Detail Tests	30
	4.	Short Delay Pickup	30
	5.	Short Delay Time	31
	6.	Instantaneous	31
	7.	Ground Delay Pickup	31
F.		Federal Pacific Solid State Trip Device	33
	1.	Connections and Test Set Settings	33

2. Long Delay Pickup 34
3. Long Delay Time 35
4. Short Delay Pickup 35
5. Short Delay Time 35
6. Instantaneous 36

IV. Service and Repair Order Instructions 37

V. Parts List and Schematics 39

SECTION I

GENERAL DESCRIPTION

The MULTI-AMP Model SCB-100 Static Breaker Test Set contains all the necessary switches, controls, meters and timer required to do function and timing tests under field conditions. The design of the set allows these tests to be made easily and conveniently under field conditions with a minimum of preparation. It is not intended for use in calibrating static overcurrent trip devices.

It can be used to test the static trip device on the circuit breaker assembly or individual static trip device by itself.

The test set is completely self-contained including multi-range ammeter and DC voltmeter. Provision is made for use of an external ammeter when greater accuracy is required.

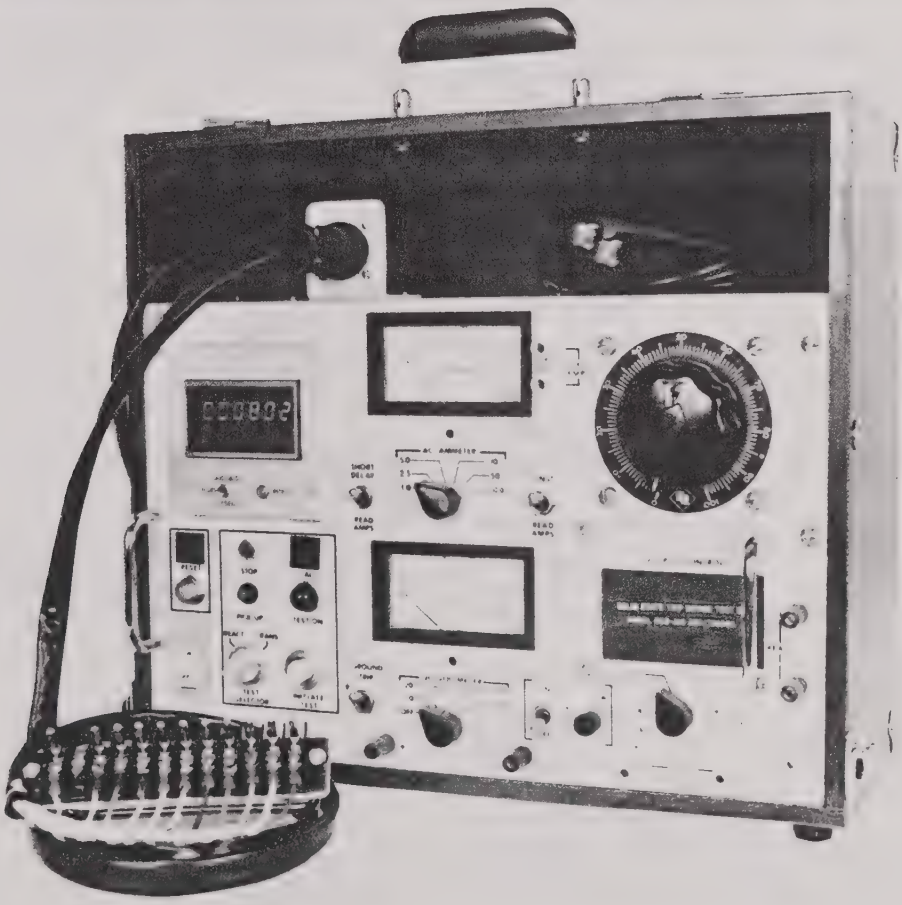
Power requirements are within the capability of an ordinary 115 volt circuit.

multi-amp CORPORATION

4271 Bronze Way Dallas, TX 75237-1088 U.S.A. Phone (214) 333-3201
Telex 163548 U.S. Fax (214) 333-3533 Export Fax (214) 337-3038

Multi-Amp Canada, 180 Middlefield, Scarborough, Ontario, Canada M1S 4M6
Phone (416) 298-6770 Telex 065-25453 Fax (416) 298-7214

SOLID-STATE TRIP DEVICE TEST SET
Model SCB-100



Description

The Multi-Amp® Model SCB-100 Solid-State Overcurrent Trip Device Test Set is a lightweight, completely self-contained unit that delivers a controlled current to the trip device under test equivalent to the secondary current of the breaker current transformers.

Applications

This unit performs function and timing tests on Allis Chalmers, Westinghouse, Square D and Federal Pacific solid-state overcurrent trip devices used in association with low-voltage power circuit breakers. Tests may be conducted on the trip devices independent of the breaker or in conjunction with a de-energized breaker.

©1992, Multi-Amp Corporation

(over)

Features

- High accuracy — checks pickup current to 0.1 A
- Electronic timer accurate to ± .005 seconds and ± 1 cycle
- Advanced design circuitry in a single unit compatible for testing different manufacturers' devices: Westinghouse Amptector, Square D Amptector, Federal Pacific SS-1, Allis Chalmers First Generation and Static Trip II.
- Completely self-contained — no external instrumentation required
- Solid-state construction for field reliability and minimum weight
- Connecting cable and adapter terminal for Westinghouse and Square D trip devices at no additional cost
- Test Point Terminal Adapters provided for Allis Chalmers and Federal Pacific trip devices at no additional cost
- Detailed instruction manual

Specifications

Rating
0.6 kVA continuous

Input
120 V, single-phase, 60 Hz

For 240-V input, optional Model TX-2 Input Autotransformer required.

Output
Reactor: 0 to 120 V at 5 A

Transformer: 0 to 10 V at 30 A

Output Control
Continuously adjustable in stepless increments from 0 to full rated output.

Model SCB-100 is shipped complete with connecting cable and adapter terminal for Westinghouse and Square D solid-state trip devices and with Test Point Terminal Adapters for Allis Chalmers and Federal Pacific devices.

Instrumentation

AC Ammeter
Multi-range, 3½-in., recessed taut-band instrument with knife-edge pointer.
Scales: 10/25/50 A
Ranges: 0 to 1/2.5/5/10/50/100 amperes AC
Accuracy: ± 2% full scale

DC Voltmeter
Multi-range, 3½-in., recessed taut-band instrument with knife-edge pointer. Binding posts are provided to allow use as an independent measuring instrument.
Scales: 10/20 V
Ranges: 0 to 10/20/100/200 volts DC and off
Accuracy: ± 2% full scale

Digital Timer
Six-digit electronic digital timer accurate to ± .005% ± least significant digit.
Ranges in seconds: 0 to 9999.99, 0 to 99.9999
Ranges in cycles: 0 to 999999

Enclosure

Test set is housed in a convenient, rugged Formica enclosure with removable, hinged cover and carrying handle.

Dimensions

15 H x 17 W x 10 D in.
(381 H x 432 W x 254 D mm)

Weight

50 lbs. (22.7 kg)

Ordering Information

Item (Qty.)	Part No.
Model SCB-100	SCB-100
Instruction manual (1)	MNSCB-100

Standard Accessories

Current Leads	
#6, 5 ft. (1 set)	1285
Test leads	
Red, banana to banana, 5 ft. (1)	WRTLB-60-0
Black, banana to banana, 5 ft. (1)	WRTLB-60-2
Banana to alligator, 4 ft. (1 set)	WRTL07500
Static trip II, 5 ft. (1 set)	14341
Test jack, amptector, 5½ ft. (1)	SCA810B334

multi-amp CORPORATION

4271 Bronze Way Dallas, TX 75237-1088 U.S.A. Phone (214) 333-3201
Telex 163548 U.S. Fax (214) 333-3533 Export Fax (214) 337-3038

Multi-Amp Canada, 180 Middlefield, Scarborough, Ontario, Canada M1S 4M6
Phone (416) 298-6770 Telex 065-25453 Fax (416) 298-7214

Printed in U.S.A. MA-6130 Bulletin-3 SCB-100 MIL/5M/1291

SECTION II

THEORY OF OPERATION

Trip devices are easily tested under field conditions with the availability of portable test equipment. Tests on more than one manufacturer's type can be accomplished during routine maintenance. Calibration cannot normally be done under field conditions.

The tests can be done on a de-energized breaker assembly located in the DISCONNECT position in its cubicle, on the completed breaker away from its cubicle, or on a trip device removed from the breaker. It is not necessary to remove permanent wiring in order to make tests.

Good test results, particularly on those tests involving the measurement of time delay, require careful attention and proper use of facilities. The ammeter used to measure test current should be accurate and recently calibrated, and should be read carefully. Any error in current measurement will cause an apparent error in timing of double magnitude. Fluctuations in the test supply voltage will change the test current and cause an apparent error in timing. Currents should be monitored during test, and the test repeated if the set current varies.

Knob settings on the trip device can cause apparent errors if the pointers are not aligned with the calibration marks. Large errors may be found if the knob has been moved relative to its shaft.

The test equipment and procedures described here permit testing at multiples (above approximately 10x) of pickup current. The tests allow all circuits of the trip device to be checked. If they are functioning properly and in calibration at low multiples, it is practically impossible for the high end to be in error.

DESCRIPTION OF CONTROLS

INPUT CIRCUIT BREAKER	The INPUT CIRCUIT BREAKER controls the input power. It is used as the power ON-OFF control and provides overload protection for the test set.
RESET Pushbutton	This button resets the timing circuit to accept a tripping signal from the static trip unit under test.
RESET Light	The RESET Light, when lit, indicates the timing circuit is ready to accept a tripping signal.

POWER ON Indicator Digital Timer	When the INPUT CIRCUIT BREAKER is in the ON position, the LED of the Electronic Timer lights up to indicate power is connected to the test set.
TEST SELECTOR	This selector switch selects the output mode of the test set - REACTOR or TRANSFORMER output.
PICKUP Light	Indicates pickup in TRANSFORMER mode.
STOP Pushbutton	This pushbutton will interrupt the test cycle and deenergize the test set.
INITIATE Pushbutton	This pushbutton controls the test circuit. It must be depressed to initiate the test. Test circuit will automatically lock unless CAL pushbutton is pressed. Both the CAL and INITIATE pushbuttons must be pressed simultaneously to calibrate test currents, without locking in timing circuit.
TEST ON Light	This light indicates the test circuit is energized.
AMMETER RANGE Switch	This switch selects the proper AMMETER range for the desired test current.
EXT-AMPS Binding Posts	These binding posts are provided to allow the connection of an ammeter (0-5A) with higher accuracy in the reactor test circuit.
D.C. VOLTMETER Selector Switch	This switch selects the desired voltmeter ranges. Binding posts are provided to allow the multi-range voltmeter to be used as an independent measuring circuit within the range of the meter.
OUTPUT CONTROL	This allows continuous control of the output current form zero to maximum for each mode of test set.
OUTPUT Binding Posts	OUTPUT Binding Posts are provided for reactor mode of operation of the test set... (1) - (2) for reactor. A special adapter cable is provided for TRANSFORMER mode of operation to test Westinghouse LS series trip units.

SECTION III

STANDARD TEST PROCEDURES

ALLIS CHALMERS STATIC TRIP DEVICE TESTS - FIRST GENERATION

NOTE: In order to help avoid confusion, the items that appear on the test set have been noted by CAPITAL letters and those items on the static trip units are noted by *Italics*.

NOTE: The As Found settings of the trip unit should be recorded before any testing begins. The settings will need to be changed as part of the testing. It will be necessary to confirm that the trip unit has the proper settings at the completion of testing.

The SCB-100 Static Breaker Test Set enables static overcurrent trip devices to be tested without the need of high primary circuit currents. It delivers to the static devices a small, controlled current. This current is the functional equivalent of the secondary current from the circuit breaker current transformers.

The low power test set enables tests to be made at the low and medium current end of the time-current curve. This is valid since the shape of the curve is determined by components in the static trip.

Tests of this nature are subject to a slight error due to such things as instrument error, human error, current wave shape, etc. The tendency will be to show the timing slightly faster (approx. 10%) than the typical curve indicates.

DESCRIPTION OF TESTS

Refer to manufacturer's literature before proceeding with tests.

FUNCTION TEST	This test determines that the static trip device is operational. It supplies the static trip device with an input above the pickup setting and establishes that an output is produced.
POWER SUPPLY TEST	This test verifies that the internal power supply of the static trip device is functioning normally and regulating to variations in input.
PICKUP TEST	This test is used to verify that the pickup current properly corresponds to the pickup dial setting. It checks the turn on of the trigger circuit to assure timing will start at pickup level.
TIME DELAY TEST	The overcurrent time-to-trip is measured in this test to assure the settings will produce time delay as specified by current-time characteristic curves.

TRANSFER TEST — This test verifies that the circuit used to transfer from Long Delay to Instantaneous and Short Delay is functioning properly.

TRIP SIGNAL TEST — Determines that the static overcurrent trip device produces a proper output for tripping the breaker.

TEST PROCEDURE

CAUTION

Refer to manufacturer's literature before proceeding with tests.

TEST CONNECTIONS

1. Connect the test set to a suitable source of power. Make sure the INPUT CIRCUIT BREAKER is on OFF position.

2. Connect the test terminals marked REACT to appropriate terminals on static trip device.

3. Connect the terminals marked STATIC TRIP OUTPUT to the static trip device, if timing tests are to be made or if a circuit breaker is not used as a trip indication.

NOTE: Circuit breakers should be moved to the DISCONNECT position in the cubicle for testing, or moved to a convenient work area. When a complete circuit breaker is being tested, it is not necessary to remove any of the permanent wiring connections. The only exception to this is on breakers that have a bell alarm relay, if timing tests are to be made (it can of course, be left in during normal function tests). This is because the Test Set time-measuring circuit uses a relay the same as a bell alarm relay, and two such relays might give an erroneous no-trip indication. A multi-range ammeter is provided in the test set, but binding posts are provided for use on an external 0-5 amp ammeter, if greater accuracy is desired.

4. Turn on the INPUT CIRCUIT BREAKER. The Digital Timer's LED should glow indicating the set is energized.

5. The test set is now ready for use.

FUNCTION TEST

NOTE: In many instances this is the only test that need be made on static overcurrent trip devices.

TRIP SIGNAL TEST

This test may be used in conjunction with any other test that produces a circuit breaker tripping signal.

Connect the VOLTMETER to *Terminals 7* and *8* (*8* is positive). When the test being conducted produces a trip signal, the VOLTMETER will suddenly jump to a reading of approx. 8 to 10 volts. This voltage will disappear when the test current is shut off.

LONG DELAY PICKUP

1. Connect Test Set as shown in Figure 1.

2. Connect VOLTMETER as follows:

   Models C, and C-1:

   Terminals 5-6 (Connect 5 to positive and 6 to negative)

   Models A, A-1, A-2, D, and D-1: D 2

   Terminals 5-4 (Connect 5 to positive and 4 to negative)

   Models AG, AG-1, and DG:

   Terminals 5-2 (Connect 5 to positive and 2 to positive)

3. Set *Pickup Knobs* at *A*.

4. Press INITIATE button.

FIGURE #1

Drawing 25169A

5. Increase the current slowly until the VOLTMETER suddenly jumps from a very low value to approx. 6 to 8 volts. This is the pickup point and the AMMETER should read 0.5 amps. The test current for other pickup settings is given in the manufacturer's literature.

NOTE: The pickup test is sensitive to the wave shape of the test current. This may cause an apparent low reading in the order of 10%, in addition to the production tolerance of plus or minus 10%. Thus, if the test shows that pickup is within these limits, the pickup calibration marks can be relied upon.

6. Press STOP button.

LONG DELAY TIME

1. Connect Test Set as shown in Figure 1.

2. Set *Pickup Knobs* at *A*, set *Instantaneous* (or *Transfer*) *Knob* at *10X* or higher, and close the circuit breaker (if used).

3. Press INITIATE Test Button to energize the output. Quickly increase the current to 1.5 amps (3X pickup) by adjusting OUTPUT CONTROL. The circuit breaker should trip (and the time stop) in approx. 10 to 45 seconds, depending on the time band used. (See the manufacturer's Current-Time Curve for the appropriate static trip device).

4. Reset timer and push RESET button to ready the device for the next test.

5. Repeat as desired, using same or different settings and test currents.

SHORT DELAY TIME

On *Models D*, *D-1*, and *DG Static Overcurrent Trip Devices*, it is also possible to test the time delay on the short time bands. The procedure is as above, except set the *Transfer Knob* at *5X*, and the test current at 5 amps (approx.). The time to trip will be very short, as shown on the current-time curve. Each time-band may be tested by selecting the desired short time band.

On *Models D, D-1* and *DG*, the above procedure will not give a completely accurate result since there is time delay associated with the short-time bands. In this case, connect the VOLTMETER to *Terminals 4* and *6*, and as the current is increased, the VOLTMETER will suddenly go to a reading of 5 to 8 volts at 2.5 amps. This indicates that transfer to the short-time band has occurred.

INSTANTANEOUS

1. Change the *Instantaneous* (or *Transfer*) *Knob* to the *5X* setting.

2. With *Pickup Knobs* at *A* quickly increase the current to 2.5 amps (5x pickup). The circuit breaker should trip instantly at approximately 2.5 amps and the timer stop.

3. Reset timer and push RESET button to ready the device for the next test.

4. Repeat as desired.

GROUND DELAY

On *Models AG, AG-1* and *DG Static Overcurrent Trip Devices*, it is not practical to test for time delay or pickup on the Ground Delay circuit because of the high saturated reactance in that circuit. That is not a detriment since tests on the phase circuits (*Terminals 1-2, and 3-2*) also prove the timing and pickup of the Ground Delay circuit.

POWER SUPPLY TEST

1. Connect Test Set as shown in Figure 1.

2. Connect VOLTMETER as follows:

   Models A, A-1, A-2, D, and D-1:

   Terminals 8-4 (Connect 8 to positive and 4 to negative)

   Models AG, AG-1, and DG:

   Terminals 8-2 (Connect 8 to positive and 2 to negative)

   Models C, and C-1:

   Terminals 8-6 (Connect 8 to positive and 6 to negative)

3. Press INITIATE button.

4. Adjust the OUTPUT CONTROL on the Test Set until the current is about 0.5 amps. The VOLTMETER should read as follows:

Models A, C, and C-1:

Between 12 and 18 volts

Models A-1, A-2, AG, AG-1, D, D-1, and DG:

Between 20 and 24 volts

5. Increase the current briefly to about 1 amp. The voltage should not change significantly. This indicates that the power supply is normal. If it does, this could be an indication that the power supply is bad.

6. Reset timer and push RESET button to ready the device for the next test.

7. Repeat as desired.

TRANSFER TEST

1. Connect Test Set as shown in Figure 1.

2. Set *Pickup* at *A* and *Instantaneous* or *Transfer* at *5x*.

3. Press INITIATE button.

4. Increase the current rapidly until the circuit breaker trips, which should be at 2.5 amps. Other combinations of current and settings may also be tried.

5. Press STOP button.

It is apparent that the time delay before obtaining a trip signal can easily be predicted from the known static trip device settings, the known test current, and the appropriate current-time curve.

GENERAL NOTES AND COMMENTS

This instruction is intended to describe the details of Test Set operation. For a completed description of the operation, settings, and application of static overcurrent trip devices as well as further comments on the testing and on test results, references should be made to the manufacturer's instruction books for the individual static trip devices.

ALLIS CHALMERS TRIP II STATIC TRIP DEVICES

NOTE: In order to help avoid confusion, the items that appear on the test set have been noted by CAPITAL letters and those items on the static trip units are noted by *Italics*.

NOTE: The As Found settings of the trip unit should be recorded before any testing begins. The settings will need to be changed as part of the testing. It will be necessary to confirm that the trip unit has the proper settings at the completion of testing.

Trip devices can be tested when mounted on a breaker removed from the cubicle, or with the device separate from the breaker.

The following instructions cover testing of all the elements for the most complicated type of trip device. Other types do not contain all these elements. See the listing and description of available types in Table II.

TESTING WITH THE STATIC TRIP ON THE BREAKER

CAUTION

The static trip input is capacitively coupled to the circuit breaker frame through a surge capacitor. Therefore to insure against electrical shocks be sure to ground the frame when testing with the circuit breaker out of the cubicle.

CONNECTIONS

Figure 2 shows how to connect the test set leads to the trip device. The red and black banana plugs may be left disconnected for pickup tests to avoid trigger instability. However, they should be plugged into *Terminals 8* and *7* as shown for all other tests.

LONG DELAY PICKUP

It is not necessary to operate the breaker for this or other pickup tests.

1. Leave the red and black banana plugs disconnected. To test phase A connect the green plug to *Terminal 1* and the white plug to *Terminal 9*. Connect the black VOLTMETER plug to *TP 1* and the orange plug to *TP 3*.

2. Set *Long Delay Pickup* on *Dot A*

3. Place AMMETER range switch in 1.0 amp position.

4. Turn the INPUT CIRCUIT BREAKER on. The electronic timer LED should come on. Press the INITIATE test button.

5. Raise the current gradually until the VOLTMETER deflects suddenly to 15 volts or more. This should occur at 0.5 amps +/- 10%.

6. Decreasing the current slightly should cause the VOLTMETER reading to drop to a low value.

7. Repeat for the other phases and for other settings and compare with the bottom line of Table I.

NOTE: The sudden appearance of this trigger voltage indicates that the time delay has started. If the current drops slightly, causing the trigger voltage to disappear, the timing current resets instantly and timing will start over upon the next appearance of triggering.

LONG DELAY TIME

Test delay at an input current of 6 times pickup setting.

1. Connect the green plug to *Terminal 1*, the white plug to *Terminal 9*, the black banana plug to *Terminal 7*, and the red to *Terminal 8*. Connect the black VOLTMETER plug to *TP 1* and the orange to *TP 3*.

2. Set *Long Delay Pickup* on *A*, *Long Delay Time Band* on *1*, *Short Time* and *Instantaneous Pickups* fully counterclockwise, and *Short Time Band* at *Maximum* (fully clockwise).

3. Place AMMETER range in 5.0 amps position.

4. Press the INITIATE TEST Button and adjust current to 3.0 amperes (6 times A pickup).

5. Press the Stop Button and the clock reset to zero.

6. Press the INITIATE TEST Button; hold this button until the static trip device times out.

7. When the breaker trips, check the operation time against the table on the trip device faceplate against the manufacturer's curves. While it may differ some from the exact faceplate value, it should fall within the band on the curve.

8. Repeat steps 6 and 7 one or more times to verify the test results. Repeatability accuracy should be very high.

9. Repeat for other time bands and other values of times pickup current as desired. All points should fall within the bands. Each time band should have precisely twice the delay of the next lower band.

NOTE: When timing at values of current only slightly above pickup, line voltage fluctuations may cause detriggering and result in erroneous operating times. (See note at the end of Long Delay Pickup Test.) Therefore it is advisable to watch the VOLTMETER during timing to note whether trigger voltage is maintained.

SHORT DELAY PICKUP

NOTE: To avoid overheating do not maintain the higher currents any longer than necessary.

1. Connect the orange VOLTMETER plug to *TP 4* and the black plug to *TP 1*, the green plug to *TP 1*, and the white to *TP 9*.

2. Set *Long Delay Pickup* on *A*, *Instantaneous* at *Maximum* (fully counterclockwise), *Long Delay Time Band* on *6*, and *Short Time Pickup* on 3X.

3. Place AMMETER range switch in 2.5 amp position.

4. Press the INITIATE TEST Button.

5. Raise the current gradually until trigger voltage of 15 volts or more appears. This should occur at 1.5 amps +/- 10% (3 x 0.5)

6. Repeat for *Short Time Pickup* settings of *5X*, *8X*, and *12X*.

FIGURE 2

DRAWING 25170A

SHORT DELAY TIME

NOTE: Avoid maintaining high currents longer than necessary to get accurate readings.

1. Connect the green plug to *Terminal 1* (Phase A), the white plug to *Terminal 9*, the black banana plug to *Terminal 7*, and the red plug to *Terminal 8*. The VOLTMETER plugs are not needed.

2. Set *Long Delay Pickup* on *A*, *Long Delay Time* on *6*, *Instantaneous* at *Maximum*, *Short Delay Pickup* at *3X* (1.5 amps), and *Short Delay Time* on *Maximum*.

3. Place AMMETER range on 2.5 amps position. Press the INITIATE test button and adjust the current to 2 amps or more.

4. Press STOP pushbutton.

5. Close the breaker.

6. Press the RESET button.

7. Press the INITIATE test button. The breaker should trip in 0.4 to 0.5 seconds.

8. Repeat for *Short Time Band* settings of *Intermediate* and *Minimum* and for other values of current and pickup if desired.

INSTANTANEOUS

There is no trigger output for *Instantaneous* but tripping of the breaker and/or operation of the test set trip relay will indicate instantaneous operation.

NOTE: Avoid maintaining high currents longer than necessary to get accurate readings.

1. Connect the red and black plugs to *Terminals 8* and 7, the green plug to *Terminal 1*, and the white plug to *Terminal 9*. The VOLTMETER plugs are not needed.

2. Set *Long Delay Pickup* on *A*, *Long Delay Time Band* on *6*, *Short Time Pickup* at *Maximum* (full counterclockwise), and *Instantaneous* on *3X*.

3. Close the breaker.

4. Place AMMETER range in 2.5 amp position.

5. Press the RESET Button and the INITIATE TEST Button.

6. Raise the current slowly until the breaker trips. This should occur at 1.5 amps +/- 10% (3 x 0.5).

7. Repeat for other settings as desired.

GROUND DELAY PICKUP

1. Connect the green plug to *Terminal 4*, the white plug to *Terminal 9*, the black VOLTMETER plug to *TP1*, and the orange VOLTMETER plug to *TP 2*.

2. Set *Ground Delay Pickup* on the *15% dot*.

3. Place AMMETER range switch in 1.0 amp position.

4. Press the INITIATE TEST button and raise the current gradually until trigger voltage of 15 volts or more appears. This should occur at 0.15 ampere +/- 10%. Repeat for the *25%* (0.52 amp) and other settings. See the bottom line of Table I for settings in amperes.

GROUND DELAY TIME

NOTE: Avoid maintaining high currents longer than necessary to get accurate readings.

1. Connect the green plug to *Terminal 4*, the white plug to *Terminal 9*, the red plug to *Terminal 8*, and the black to *Terminal 7*. The VOLTMETER plugs are not needed.

2. Set *Ground Delay Pickup* on *15%* (0.15 amp) and *Ground Delay Time Band* on *Maximum*.

3. Place AMMETER range switch to 1.0 amps range.

4. Press the INITIATE test button and adjust the current to 0.5 amperes or more. (Erroneous time delays may be obtained at lower currents due to test set wave shape distortion. Also the target, if any, may fail to operate for the same reason.)

5. Press the STOP pushbutton.

6. Press the RESET button.

7. Press the INITIATE test button. The breaker should trip in 0.4 to 0.5 seconds. If there is a ground target, the red button should pop out. Rest the target by pushing the button in.

8. Repeat for other *Ground Delay Time Band* settings and also for other pickup and current values if desired.

BENCH TESTING STATIC TRIP II DEVICES CONNECTIONS

With the static trip device away from the breaker it is necessary to make connections to the fanning strip which terminates the wiring cord of the trip device. Place the fanning strip under the outer row of screws of the terminal block on the test set, and tighten all screws. The end of the fanning strip nearest the cord must connect to *Terminal 1*. Connections can now be made to the brass jacks on the terminal block, using the test set banana plugs exactly as done when testing with the trip device on the breaker. The terminal block is not connected internally. It serves only as a means of connection for the banana plugs.

BENCH TEST PROCEDURES

The testing procedures are exactly the same as given in TESTING WITH THE STATIC TRIP ON THE BREAKER except of course, that any reference to the breaker is ignored.

TABLE I

STATIC TRIP II

RATING TABLE - AMPERES

Breaker Type and Frame Size	Tripping XMFR Rating Primary	Long Time Element Calibrated Pickup Settings							Max. Cont. Rating	Ground Element Calibrated Pickup Settings			
		A	B	C	D	E	F	G		15%	25%	50%	100%
LA-600	80	40	50	60	70	80	90	100	100	-	-	40	80
600	200	100	125	150	175	200	225	250	250	30	50	100	200
Amperes	400	200	250	300	350	400	450	500	500	60	100	200	400
	600	300	375	450	525	600	675	750	600	90	150	300	600
LA-1600	200	100	125	150	175	200	225	250	250	-	50	100	200
1600	400	200	250	300	350	400	450	500	500	60	100	200	400
Amperes	800	400	500	600	700	800	900	1000	1000	120	200	400	800
	1600	800	1000	1200	1400	1600	1800	2000	1600	240	400	800	1600
LA-3000	2000	1000	1250	1500	1750	2000	2250	2500	2500	300	500	1000	2000
3000	3200	1600	2000	2400	2800	3200	3600	4000	3000	480	800	1600	3200
Amperes													
LA-4000	4000	2000	2500	3000	3500	4000	4500	5000	4000	600	1000	2000	4000
4000													
Amperes													
Secondary Pickup Current Amperes		0.50	0.625	0.75	0.875	1.00	1.125	1.25	-	0.15	0.25	0.50	1.00

GENERAL NOTES

1. The *Tripping XFMR Rating* values represent the primary value of the current transformer ratio in amperes. The secondary value is one ampere.

2. The pickup settings of the *Long Delay Element* are continuously adjustable, and are calibrated at points *A* thru *G* as shown in the rating table.

3. The pickup settings of the *Instantaneous* and *Short Time Delay* elements are continuously adjustable and are calibrated at *3,5,8,* and *12* multiples of the *Long Delay Pickup* setting.

4. The pickup settings of the *Ground Delay Elements* are continuously adjustable, and are calibrated in percent of the tripping transformer rating as shown in the rating table.

5. The *Long Delay Element* has 6 bands which are field selectable. The time delay at 6 multiples of pickup is as follows.

   Band 1 - 1.12 seconds
   Band 2 - 2.25 seconds
   Band 3 - 4.5 seconds
   Band 4 - 9 seconds
   Band 5 - 18 seconds
   Band 6 - 36 seconds

6. The *Short Time Element* and *Ground Delay Element* have 3 bands which are calibrated at *Minimum*, *Intermediate*, and *Maximum*. These bands are continuously adjustable.

7. The maximum interrupting time is the maximum length of time that fault current flows, including arcing time.

8. The lower limit of ground fault recognition is 25 amperes for an LA-600 breaker and 40 amperes for an LA-1600 breaker.

REPAIR OF STATIC TRIP DEVICES

Because of the complexity of the semiconductor components and circuits and because some of the components are especially selected or matched, we do not recommend field repair of static trip devices. Moreover component failure usually does not show up as visual damage and locating the defective component requires specialized techniques. Therefore if the tests described in these instructions indicate that a static trip device is defective, contact your nearest Allis-Chalmers representative for instructions on returning the unit to the factory for repair.

TESTING THE TRIP ACTUATOR

If the trip device fails to trip the breaker, the trouble may be in the tripping actuator.

TESTING WITH THE ACTUATOR ON THE BREAKER

1. Place the Toggle Switch to the ACT TEST ON position. This deenergizes the + white and - white plugs on the test set.

2. Connect the red banana plug to *Terminal 8* and the black banana plug to *Terminal 7* of the static trip device. Connect the orange VOLTMETER plug to the red terminal post on the test set and the black VOLTMETER plug to the black post.

3. Close the breaker.

4. Slowly raise the voltage from the internal dc supply with the ACT TEST knob, and note the voltage at which the breaker trips. This should be somewhere between 4.5 volts and 9.0 volts.

5. Failure of the breaker to trip at any voltage even up to 12 volts may be due to the plunger of the actuator not being reset fully by the breaker mechanism. This can be checked visually. See the circuit breaker instruction book.

6. Measure the actuator coil resistance. The coil leads are the small red and black wires connected to *Terminals 7* and *8* on the static trip terminal block. The measurement should be made with the static trip device disconnected. For Static Trip II loosen the seven screws and remove the connecting strip from the terminal block and measure between the wires. (Be sure to reconnect correctly with the red wire on *Terminal 8* and the black on *Terminal 7*. There are two types of actuator. If the resistance is between 30 and 40 ohms, tripping voltage should not be more than 9 volts.

BENCH TESTING ACTUATORS

1. Place the toggle switch to the ACT TEST ON position. This deenergizes the + white and - white plugs (on the set).

2. Connect the *Actuator* red lead and orange VOLTMETER plug to the red post on the test set. Connect the *Actuator* black lead and the black VOLTMETER plug to the black post.

3. Manually reset the *Actuator* by pushing the plunger rod all the way in.

4. Slowly raise the internal dc supply voltage with the CURRENT ADJUST knob and note the voltage at which the *Actuator* trips.

TESTING THE TRIPPING TRANSFORMERS

The tests described in the preceding instructions verify performance of the static trip device and the tripping actuator.

The third link in the protection system is the breaker-mounted tripping current transformers. When secondary current testing is done with the static trip on the breaker, the tripping transformer with shorted turns would show up in the form of pickup values above tolerance. However, there would be no way of knowing whether the problem was in the static trip or the transformers. Moreover, an open circuit in the transformer winding or wiring would not show up at all. Therefore, it is desirable to test the tripping transformers as described in the following.

TEST PREPARATIONS

If the static trip device is on the breaker remove it or disconnect it. For Static Trip II, disconnect by removing the connecting strip from the terminal block.

Breakers that are wired for four wire ground fault protection have a tripping current transformer external to the breaker either on the neutral bus or the ground strap. This external CT is wired to the breaker through secondary disconnect fingers. To test this CT the breaker must be in the cubicle in the Test position. If in doubt, refer to the breaker wiring diagram.

There are two tests to be made, i.e., winding continuity and exciting current.

CONTINUITY TEST

The continuity test must be performed on tripping transformers rated 1000:1 amps or higher because normal exciting current is too low to read. The exciting current test will verify continuity on transformers of lower rating.

An Ohmmeter is most suitable for the continuity test. For breakers with Static Trip II, test in turn across *Terminal 1 to 9, 2 to 9, and 3 to 9* of the terminal block for phase A, B, and C, respectively. For breakers with first generation trip devices test from each of the three heavy black wires to the heavy white wires. If the cubicle is wired for four wire ground protection, check the remote mounted CT by testing from *Terminal 4* to *Terminal 9* for Static Trip II and from the white wire for the wire that was connected to *Terminal 9* for a breaker with model *4WAG* or *4WDG* trip device.

EXCITING CURRENT TEST

The purpose of this test is to reveal any shorted turns in the tripping transformer windings. Sixty Hertz ac voltage is applied to the secondary winding of the tripping transformer and the exciting current is monitored. Short circuited turns will be revealed by excessive exciting current and sometimes by overheating of the winding.

The test set is used as the source of ac voltage and the test set AMMETER is used to monitor exciting current. An external VOLTMETER may be connected across *Terminals 1* and *2* to monitor exciting voltage.

For exciting current tests, the selector switch should be in the REACTOR TRIP TEST position and the AMMETER range switch should be in the Low 1.0 amp position.

TABLE II

TRIPPING TRANSFORMER EXCITATION TEST

Tripping Transformer Rating	Approximate Exciting Voltage	Approximate Variable Transformer Setting	Maximum Allowable Exciting Current
Amperes	Volts	%	Amperes
80:1	33.5	25	0.25
150:1	67	50	0.15
200:1	67	50	0.15
250:1	67	50	0.15
400:1	67	50	0.05
600:1	134	100	0.05
800:1	134	100	0.03
1000:1 & up	134	100	<0.02

CONNECTIONS

For breakers with Static Trip II plug the white lead into *Terminal 9* and the green lead into *Terminals 1, 2,* and *3* in turn for phases A, B, and C, respectively. Connect the green plug to *Terminal 4* to test the neutral bus or ground strap transformer.

For first generation static trips it is recommended that bolted connections be made to the three black and one white tripping transformer leads that were removed from the terminal block and that the black leads be wired to *Terminals 1, 2,* and *3* and the white lead to *Terminal 9* of the terminal block on the test set. The test set green and white plugs can then be used to make connections just as on Static Trip II. For breakers using model *4WAG* or *4WDG* the fourth (remote CT) leads should be similarly extended and connected to *Terminal 4* of the test set terminal block.

TEST PROCEDURE

1. Connect the green plug to *Terminal 1* and the white plug to *Terminal 9.* Connect the black VOLTMETER plug to the black post on the test set and the orange plug to the red post.

2. Refer to the second column of Table II for the exciting voltage corresponding to the rating of the tripping transformers being tested.

3. Raise the voltage slowly with the OUTPUT CONTROL until the proper VOLTMETER setting is reached.

4. Note the AMMETER reading and compare with the maximum allowable exciting current given in Table II. A reading in excess of the value in the table indicates a defective tripping transformer.

5. Table II also lists the approximate AC voltage actually applied and the approximate variable transformer OUTPUT CONTROL setting. The value 0.02 amps shown in Table II for tripping transformers rated 1000 amperes and up is used because that is about the lowest readable current on the test set AMMETER. Normal exciting current may be so small that AMMETER deflection cannot be observed. That is why a separate continuity check must be performed on these ratings.

WESTINGHOUSE SYSTEM CIRCUIT BREAKER

SCB SERIES

NOTE: In order to help avoid confusion, the items that appear on the test set have been noted by CAPITAL letters and those items on the static trip units are noted by *Italics*.

NOTE: The As Found settings of the trip unit should be recorded before any testing begins. The settings will need to be changed as part of the testing. It will be necessary to confirm that the trip unit has the proper settings at the completion of testing.

Westinghouse System Circuit Breakers are easily tested using the SCB-100. The SCB-100 Static Breaker Test Set enables static breakers and static overcurrent trip devices to be functionally tested without the need of high primary current.

CAUTION

Refer to manufacturer's literature before proceeding with tests.

FIELD TEST PROCEDURE

The field test procedure is used to check the accuracy of the setting of each adjustment dial and not to calibrate the unit.

DESCRIPTION OF TESTS

LONG DELAY PICKUP	This test verifies the pickup current corresponds to the pickup setting on the *Long Delay* setting.
LONG DELAY TIME	This test verifies the overcurrent time to trip settings will produce a time delay as specified by the current-time characteristic curve.
SHORT DELAY PICKUP	This test verifies that the pickup current corresponds to the *Short Delay Pickup* setting.
SHORT DELAY TIME	This test is used to verify that the breaker trips almost instantaneously.
INSTANTANEOUS	The *Instantaneous* is not adjustable. It is necessary only to check the pickup setting. If the sensor has a *Short Delay* trip, it must be made ineffective.

TEST PROCEDURE

1. Connect the test set to a suitable source of 115 AC, 60 hz power. Make sure the INPUT CIRCUIT BREAKER is in the OFF position.

2. Connect the test terminals marked (2) and AC Common to the appropriate terminals on the static trip unit.

3. Connect the terminal marked STATIC TRIP OUTPUT to the static trip device. If timing tests are to be made or if a circuit breaker is not used as a trip indication.

NOTE: Circuit breakers should be moved to the DISCONNECT position in the cubicle for testing, or moved to a convenient work area. When a complete circuit breaker is being tested, it is not necessary to remove any of the permanent wiring connections.

4. Connect the DC VOLTMETER binding posts terminals to the appropriate terminals on the static trip unit. Set the VOLTMETER RANGE switch to 100 volts.

5. Turn on the INPUT CIRCUIT BREAKER. The Digital Timer LED's should glow indicating the test set is energized.

6. The test set is now ready for use.

LONG DELAY PICKUP

1. Depress the INITIATE TEST pushbutton and slowly increase the OUTPUT CONTROL from zero.

2. Observe and record a current reading when the needle jumps to approximately 30 volts. The ratio of this current to 2.5 or 5 amps (the output of the current monitor when the current in the breaker equals the continuous current rating of the breaker regardless of the breaker rating), should be within 10% of the *Long Delay Pickup* current setting of the static trip unit.

   For example, if the AMMETER indicated 3 amperes at the 30 volt point, with a 5 ampere input sensor the indicated ratio would be 3/5 or 60. If the actual setting were 65, the test figure would be within the limits of accuracy, that is, 65 +/- 10% is a range of 59 to 72 and the test figure of 60 falls within the range.

3. Return OUTPUT CONTROL to zero and press RESET on test completion.

LONG DELAY TIME

NOTE: If the *Short Delay Pickup* and/or *Instantaneous* is less than *6X*, raise the *Short Delay Pickup* and/or *Instantaneous* settings above *6X* or check *Long Delay Time* at current less than *Short Delay Pickup* or *Instantaneous* settings. Refer to the manufacturer's characteristic curve to determine the trip time at currents less than *6X*.

1. Depress INITIATE pushbutton.
2. Adjust OUTPUT CONTROL to a reading of 30 amperes on the AMMETER.
3. Release TEST pushbutton.
4. Press RESET pushbutton.
5. Press and hold TEST pushbutton until breaker trips. (Breaker should trip within 20% of trip time setting.)

SHORT DELAY PICKUP

1. Depress and hold the TEST pushbutton.
2. Increase the current with the OUTPUT CONTROL and note the current reading at which the breaker trips. Current must be increased fast enough to prevent tripping by *Long Delay* circuits.
3. Leave the OUTPUT CONTROL at this setting for reference in testing the Short Delay Time.
4. Release TEST pushbutton.
5. Press RESET pushbutton.

SHORT DELAY TIME

1. After performing the Short Delay Pickup Test, advance the OUTPUT CONTROL above the setting that tripped the breaker in pickup current test. Depress TEST pushbutton. Breaker should trip almost instantaneously, i.e., 2 to 10 cycles (.03 to 16 seconds).

Elaborate methods and equipment would be necessary to determine Short Delay Time accurately. For field testing, it is sufficient to observe whether the breaker trips in less than one second.

INSTANTANEOUS

Because the *Instantaneous* time is not adjustable, it is necessary to check only the pickup setting. Follow the same procedure as in the Short Delay Pickup Test. If the sensor has a *Short Delay Pickup*, the trip must be made ineffective by connecting test point *TP 2* of the sensor to *Terminal D 1*.

The tests as described check phase A of the sensor and all other components of the Systems Circuit Breaker. To check the other phases, B and C, it is necessary to conduct just one of any of the preceding tests to make sure that tripping elements are working because only one sensing and triggering circuit is used for all phases and it is common to all poles.

GROUND DELAY PICKUP

Ground current tripping can be checked by passing a current greater than 0.125 ampere for the 600 ampere sensors and 0.25 ampere for the 1200 and 2000 ampere sensors through *Terminals N* and *G*. Here again, it is sufficient to note whether the breaker trips in less than one second.

These tests check all components of the Systems Circuit Breaker except the current monitors. It is hardly possible that these can become defective unless they are physically damaged.

To test the complete system including current monitors, a testing stand must be capable of producing currents equal to the full rating and overload currents of the system. The three phase bus current monitors are mounted on the circuit breaker assembly and can be checked at a testing stand. The ground current monitor of a four-wire system cannot be checked without removing it from the fixed buswork in the switchboard.

WESTINGHOUSE AMPTECTOR SOLID STATE TRIP UNITS

CAUTION

Do not test Amptector while breaker is carrying current.

CAUTION

The Amptector has a continuous rating of 30 amperes and currents above 30 amperes should be applied for short intervals.

NOTE: In order to help avoid confusion, the items that appear on the test set have been noted by CAPITAL letters and those items on the static trip units are noted by *Italics*.

NOTE: The As Found settings of the trip unit should be recorded before any testing begins. The settings will need to be changed as part of the testing. It will be necessary to confirm that the trip unit has the proper settings at the completion of testing.

LONG DELAY PICKUP

1. Set CIRCUIT SELECTOR to A.
2. Set AMMETER switch to 5 Amps.
3. Press RESET button.
4. Press INITIATE TEST pushbutton.
5. Turn OUTPUT CONTROL knob slowly until LONG DELAY Pilot Lamp (clear) is lit. This lamp should light at 5 amperes +/- 10% (*Long Delay* Pickup of Amptector at *1.0*). Lamp will go out when current is lowered below pickup.

LONG DELAY TIME

1. Set Circuit Selector to A.
2. Set AMMETER switch to 50 amps.
3. Press INITIATE TEST pushbutton.
4. Turn OUTPUT CONTROL knob until AMMETER reads 30 amps.

5. Press STOP pushbutton.

6. Press RESET pushbutton.

7. Set the Amptector *Long Delay Time* for *36 seconds.*

8. Press timer RESET and INITIATE pushbutton.

9. Check AMMETER reading to stay at 30 amps (TEST pilot lamp should go out) between 24 and 36 seconds and timer stop.

10. Press RESET; reset lamp should go on.

11. Press RESET on timer panel; timer should reset to zero.

DETAIL TESTS

Time values on AMPTECTOR dials are top of the band, hence expect shorter times when testing.

LONG DELAY PICKUP setting=amps	*PICKUP LIMITS amps*	*SHORT DELAY INSTANT. setting=amps*	*PICKUP LIMITS amps*
.5 = 2.5	*2.25 to 2.75*	*4X = 20*	*18 to 22*
.6 = 3.0	*2.7 to 3.0*	*5X = 25*	*22.5 to 27.5*
.7 = 3.5	*3.15 to 3.85*	*6X = 30*	*27 to 33*
.8 = 4.0	*3.6 to 4.4*	*7X = 35*	*31.5 to 38.5*
.9 = 4.5	*4.05 to 4.95*	*8X = 40*	*36 to 44*
1.0 = 5.0	*4.5 to 5.5*	*10X = 50*	*45 to 55*
1.25 = 6.25	*5.6 to 6.9*	*12X = 60*	*54 to 66*

SHORT DELAY PICKUP

NOTE: Set *Instantaneous* to *Maximum.*

1. Place SHORT DELAY switch in ON position and proceed similar to Instantaneous Test above.

2. Switch to READ AMPS to read AMMETER.

CAUTION

Use STOP switch to cut off current.

SHORT DELAY TIME

1. With current set as above so that *Short Delay* will pickup, reset timer to zero. Set SHORT DELAY to OPERATIVE.

2. Press RESET then TEST and timer will give an approximate reading of the delay.

NOTE: This timer is not accurate enough for close timing of Short Delay Time, but it will show the difference between the 3 band calibrations.

The CIRCUIT SELECTOR switch permits checking to see if all Amptector phase inputs are operative. Since all feed into a common pickup and timing circuit it is only necessary to determine on one of the above tests that all inputs will cause Amptector operation.

INSTANTANEOUS

1. Set *Long Delay Time* to *Maximum* in order to not have *Long Delay* take you out too fast.

2. If *Short Delay* is in Amptector, set SHORT DELAY switch to READ AMPS.

3. Press RESET.

4. Press INITIATE TEST and increase current steadily but rather rapidly until relay "CLICKS" in SCB-100. If current is preset to about 3/4 of setting, using CAL switch, the final setting can be approached slower for better accuracy.

5. Press RESET.

6. Hold INST switch in READ position.

7. Press INITIATE TEST button and read current.

CAUTION

If relay does not cut off current when INST is released, use STOP switch to remove current.

GROUND DELAY PICKUP

a. Switch AMMETER to 5 amps.

b. Selector to GND.

c. Set current for 1.2 ampere. An external ammeter may be used for more accurate reading.

d. Amptector should trip if RESET and TEST buttons are successively pushed.

e. Ground Delay Time can be checked by reading timer. The same NOTE as in Short Time Delay applies.

When checking out settings on an Amptector for use, the general procedure is to start with the high current settings and work down to the lowest current setting.

CAUTION

Do not test amptector while breaker is carrying current

FEDERAL PACIFIC SOLID STATE TRIP DEVICE

NOTE: In order to help avoid confusion, the items that appear on the test set have been noted by CAPITAL letters and those items on the static trip units are noted by *Italics*.

NOTE: The As Found settings of the trip unit should be recorded before any testing begins. The settings will need to be changed as part of the testing. It will be necessary to confirm that the trip unit has the proper settings at the completion of testing.

The trip device can best be serviced when completely removed from the breaker.

The following procedure tests Long Delay Pickup, Long Delay Time, Short Delay Time, and Instantaneous. Each phase, as well as Ground Delay, can be tested individually.

The sensor current nominal value is 2 amperes which must be multiplied by the particular tap setting, e.g., if the pickup is set to 1.1, the actual pickup current is 1.1 x 2.0 amps or 2.2 amps, similarly, a pickup of 0.9 would mean a pickup current of 1.8 amperes (0.9 x 2).

CONNECTIONS AND TEST SET SETTINGS

Connect the Amptector Test Cable supplied with the SCB100 to the connector located at the top of the SCB100 test set. Make the following connections between the test cable and the trip unit under test:

Amptector Cable	FPE Trip Device
GREEN Wire	GND
GREY Wire	N
ORANGE Wire	C
WHITE Wire	B
RED Wire	A

Connect the SCB100 Trip (+) and Trip (-) binding posts to the FPE Trip (+) and Trip (-) binding posts.

NOTE: FPE Trip (+) must go to SCB100 Trip (+) and FPE Trip (-) must go to SCB100 Trip (-).

Set switches on the SCB-100 as follows:

TEST SELECTOR	TRANS. SHORT DELAY
SHORT DELAY/READ AMPS	SHORT DELAY
INST/READ AMPS	INST
GROUND TRIP	Up
CIRCUIT SELECTOR	A
AC AMMETER	2.5 Amps

NOTE: Record all trip device switch settings on FPE trip device to insure that all selector switches are returned to their original positions after testing.

Normally only one position must be tested. However, if it is anticipated that several settings may be used before retesting, all positions should be tested.

LONG DELAY PICKUP

1. Set the *Long Delay Time* to *1.0* and *Delay* on *MIN.*
2. Apply a current of 1.8 amperes.
3. Press RESET and Timer Reset. Select SECONDS mode with switch on timer.
4. Press the INITIATE TEST pushbutton.
5. Adjust current for 1.8 amperes.
6. Wait at least 6 minutes (360 seconds) while maintaining a current of 1.8 amperes. Unit should not trip.
7. Press STOP pushbutton.
8. Reset Timer.
9. Press INITIATE TEST.

10. Adjust current for 2.2 amperes. Unit should trip in 200-300 seconds.

NOTE: If a setting of other than *1.0* is used, the normal band may be tested by using current values equal to 2.0 amperes x pickup setting x 0.9 for no pickup and 2.0 amperes x pickup setting x 1.1 for 200-300 second pickup.

LONG DELAY TIME

1. Press the RESET pushbutton and the timer RESET pushbutton.

2. Set the AC AMPERES switch to 25.

3. Press the INITIATE TEST switch and adjust the OUTPUT CONTROL for a reading equal to 6x rating (12 amperes for a 1.0 pickup).

4. Press the STOP pushbutton.

5. Press the timer RESET pushbutton.

6. Press INITIATE TEST. The relay should trip and the timer should read between 16 and 21 seconds.

SHORT DELAY PICKUP

1. Set the relay *Short Time Pickup* switch to *4* and *Delay* to *0.25 seconds*.

2. Rotate the OUTPUT CONTROL fully counterclockwise and push the RESET button.

3. Set AC AMMETER switch to 10 amperes.

4. Press INITIATE TEST.

5. Rotate the OUTPUT CONTROL knob slowly until relay trips. The current meter should read 8 amperes. The pickup tolerance is +/- 10%. Other pickup values may be tested in the same way.

SHORT DELAY TIME

1. Rotate the relay *Short Time Pickup switch* to *10.*

2. Set the AC AMMETER switch on 25 amperes and push the RESET button and INITIATE TEST button.

3. Adjust the current to 12 amperes on the AC AMMETER using the OUTPUT CONTROL.

4. Press STOP and timer RESET buttons.

5. Set the *Short Time Pickup* to *10* and set the *Instantaneous* to *4*.

6. Push the INITIATE TEST button. The timer should indicate a time delay between 0.22 and 0.28 seconds.

INSTANTANEOUS

1. Set the *Short Time Pickup* to *10* and set the *Instantaneous* to *4*.

2. Turn the OUTPUT CONTROL knob fully counterclockwise and push the RESET button.

3. Set the AC Amperes switch to 10.

4. Turn the Current Adjuster knob slowly clockwise, until the relay trips. The current meter should indicate 8 amperes. Other values of Instantaneous may be tested similarly. Press RESET and timer RESET then INITIATE TEST. Read time.

The above procedure tests Phase A. It is recommended that one test, normally the long time pickup, be performed on each phase by changing the circuit selector switch to phase B and C as desired.

GROUND DELAY

The *Ground Delay Pickup* and *Ground Delay Time* functions are tested the same as phases except the GROUND FAULT switch must be held in the down position.

NOTE: The pickup current multiples for Ground Delay Pickup are different and the 2.0 amperes x pickup settings x desired current multiple from curve must be used to calculate trip times.

SECTION V

SERVICE AND REPAIR ORDER INSTRUCTIONS

If factory service is required or desired, contact the factory for return instructions.

A Service & Repair Order (SRO) number will be assigned for proper handling of the unit when it arrives at the factory.

If desired, a letter with the number and instructions can be provided.

Provide the factory with model number, serial number, nature of the problem or service desired, return address, your name, and where you can be reached should the factory need to contact you.

A purchase order number, cost limit, billing, and return shipping instructions may also be provided if desired.

National Bureau of Standards traceable calibration and certification of two types is available if desired at additional cost.

CLASS ONE:	A certificate is provided verifying the traceability and calibration of the equipment.
CLASS N:	That which is required for nuclear power plants. A certificate of traceability and calibration along with "as found" and "as left" data are provided.

If an estimate is requested, provide the name and contact information of the person with approval/disapproval authority.

Pack the equipment appropriately to prevent damage during shipment. If a reusable crate or container is used, the unit will be returned in it if in suitable condition.

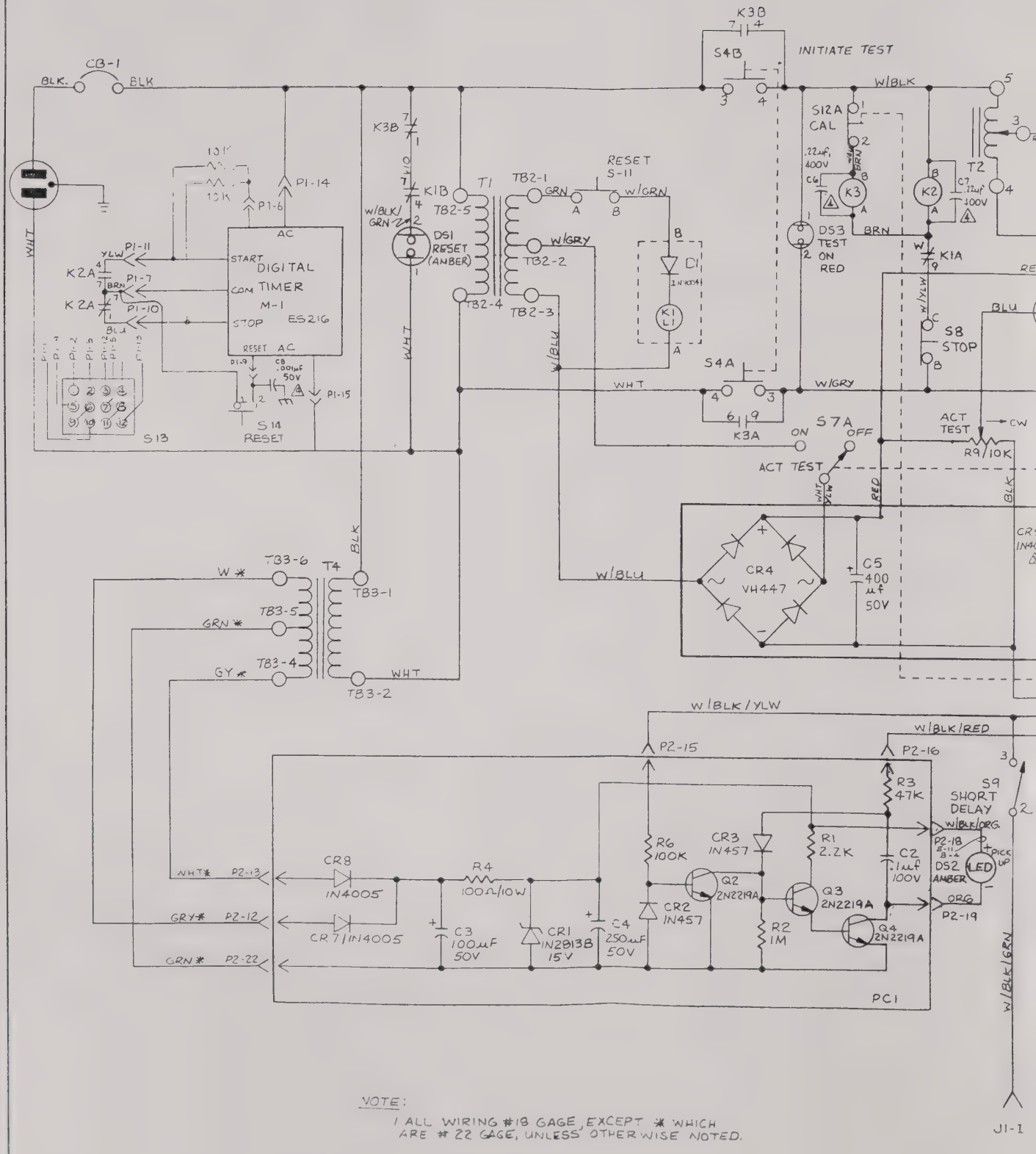
Put the SRO number on the address label of the shipping container for proper identification and faster handling.

WARRANTY

Multi-Amp Corporation warrants to the original purchaser that the product is free of defects in material and workmanship for a period of one (1) year from date of shipment. This warranty is limited and shall not apply to equipment which has damage, or cause of defect, due to accident, negligence, improper operation, faulty installation by the purchaser, or improper service or repair by any person, company or corporation not authorized by Multi-Amp Corporation.

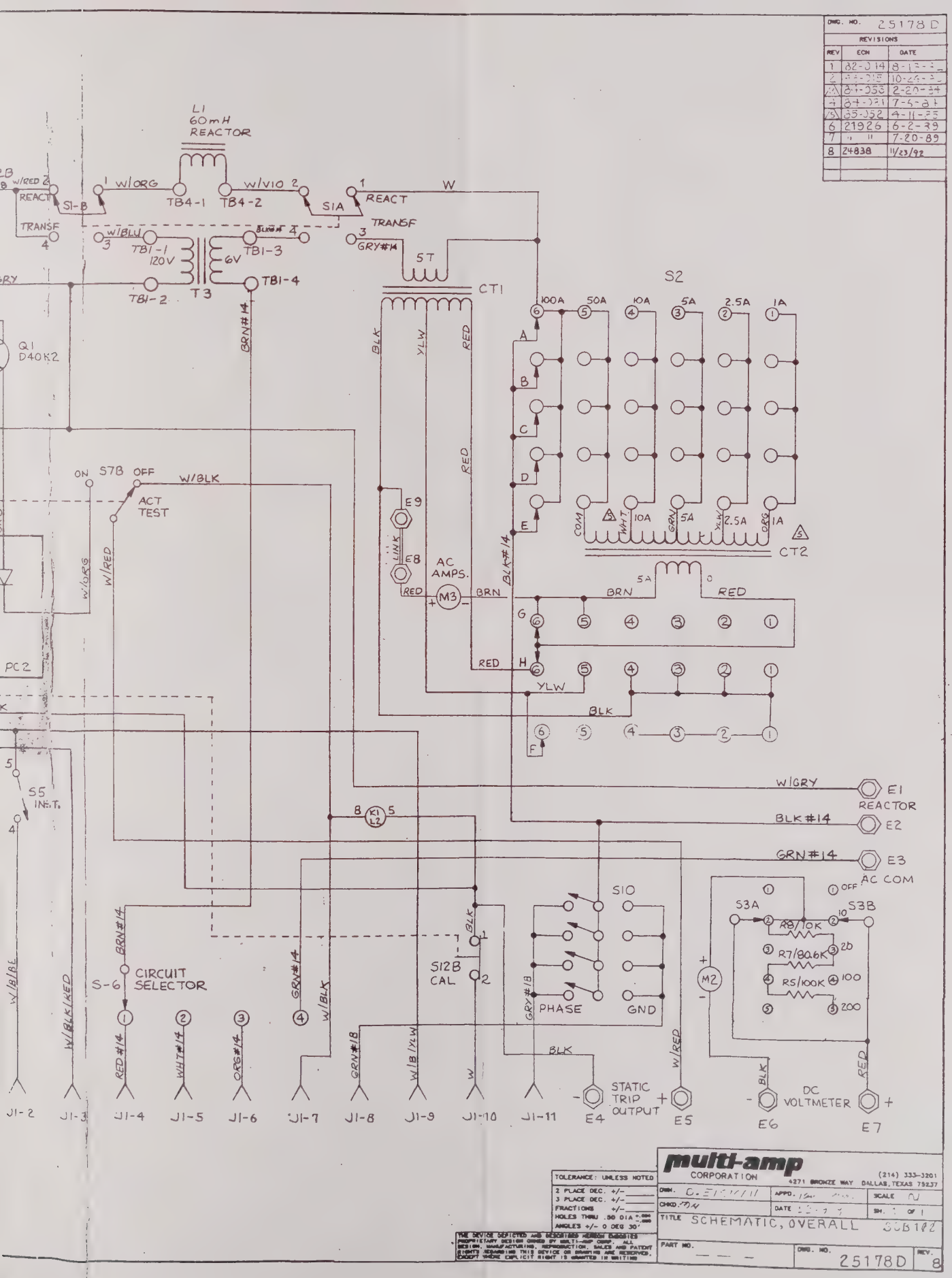
Multi-Amp Corporation will, at its option, either repair or replace those parts and/or materials that it deems to be defective. Any costs incurred by the purchaser for the repair or replacement of such parts and/or materials shall be the sole responsibility of the original purchaser.

THE ABOVE WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EITHER EXPRESSED OR IMPLIED ON THE PART OF THE MULTI-AMP CORPORATION, AND IN NO EVENT SHALL THE MULTI-AMP CORPORATION BE LIABLE FOR THE CONSEQUENTIAL DAMAGES DUE TO THE BREACH THEREOF.

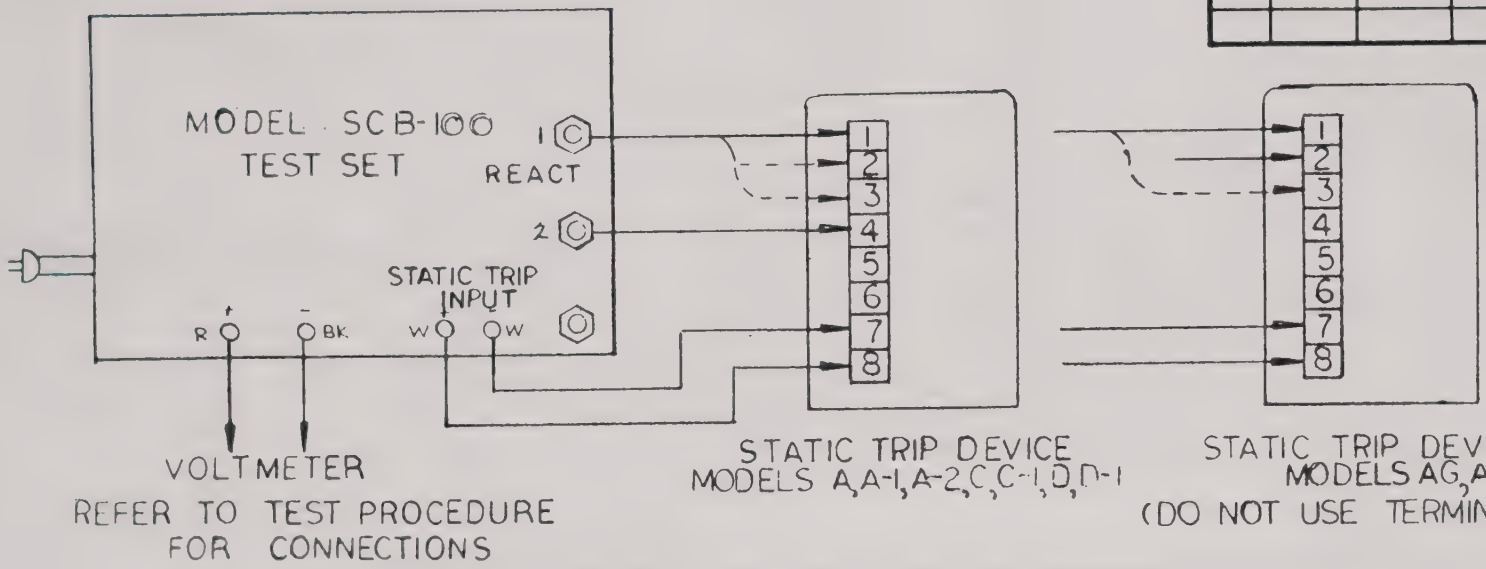


NOTE:

1 ALL WIRING #18 GAGE, EXCEPT * WHICH ARE # 22 GAGE, UNLESS OTHERWISE NOTED.


DWG. NO. 25178 D
REVISIONS
REV | ECN | DATE
1 | 82-014 | 8-12-82
2 | 83-015 | 10-24-83
3 | 84-033 | 2-20-84
4 | 84-021 | 7-6-84
5 | 85-052 | 4-11-85
6 | 21926 | 6-2-89
7 | " " | 7-20-89
8 | 24838 | 11/23/92
L1 60mH REACTOR
REACT
S1-B
TB4-1
TB4-2
S1A
TRANSF
TB1-1 120V
6V
TB1-3
TB1-2
T3
TB1-4
5T
CT1
S2
100A
50A
10A
5A
2.5A
1A
COM
CT2
Q1 D40K2
S7B
ON
OFF
ACT TEST
W/BLK
W/ORG
W/RED
E9
E8
LINK
AC AMPS.
M3
BRN
RED
BLK
YLW
GRN
ORG
PC2
S5 INST.
K1 K2
S12B CAL
S10
PHASE
GND
S3A
S3B
R8/10K
R7/80.6K
R5/100K
M2
CIRCUIT SELECTOR
S-6
W/GRY
E1 REACTOR
BLK #14
E2
GRN #14
E3 AC COM
STATIC TRIP OUTPUT
E4
E5
DC VOLTMETER
E6
E7
J1-2
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
J1-9
J1-10
J1-11
TOLERANCE: UNLESS NOTED
2 PLACE DEC. +/-
3 PLACE DEC. +/-
FRACTIONS +/-
HOLES THRU .50 DIA
ANGLES +/- 0 DEG 30'
multi-amp CORPORATION
4271 BRONZE WAY DALLAS, TEXAS 75237
(214) 333-3201
DWN. C. ELLIOTT 11
CHKD. TM
APPD.
DATE
SCALE NONE
SH. 1 OF 1
TITLE SCHEMATIC, OVERALL
SUB 182
PART NO.
DWG. NO. 25178D
REV. 8
THE DEVICE DEPICTED AND DESCRIBED HEREIN EMBODIES PROPRIETARY DESIGN OWNED BY MULTI-AMP CORP. ALL DESIGN, MANUFACTURING, REPRODUCTION, SALES AND PATENT RIGHTS REGARDING THIS DEVICE OR PARTS ARE RESERVED, EXCEPT WHERE EXPLICIT RIGHT IS GRANTED IN WRITING

DWG. NO.	25169A		
REVISIONS			
REV	ECN	DATE	REMARKS



TOLERANCES UNLESS NOTED	
3 PLACE DEC.	± .005
2 PLACE DEC.	± .02
FRACTIONS	± 1/32
HOLES THRU 1/2" DIA.	+.004 -.000
ANGLES	±0° 30'

THE DEVICE DEPICTED AND DESCRIBED HEREON EMBODIES PROPRIETARY DESIGN OWNED BY MULTI-AMP CORP. ALL DESIGN MANUFACTURING, REPRODUCTION, SALES AND PATENT RIGHTS REGARDING THIS DEVICE OR DRAWING ARE RESERVED, EXCEPT WHERE EXPLICIT RIGHT IS GRANTED IN WRITING

multi-amp
(214) 333-3201
4271 BRONZE WAY DALLAS, TEXAS 75237

DWN. EIL	APPD.	SCALE NJ
CHKD.	DATE 12	SH. 1 OF 1

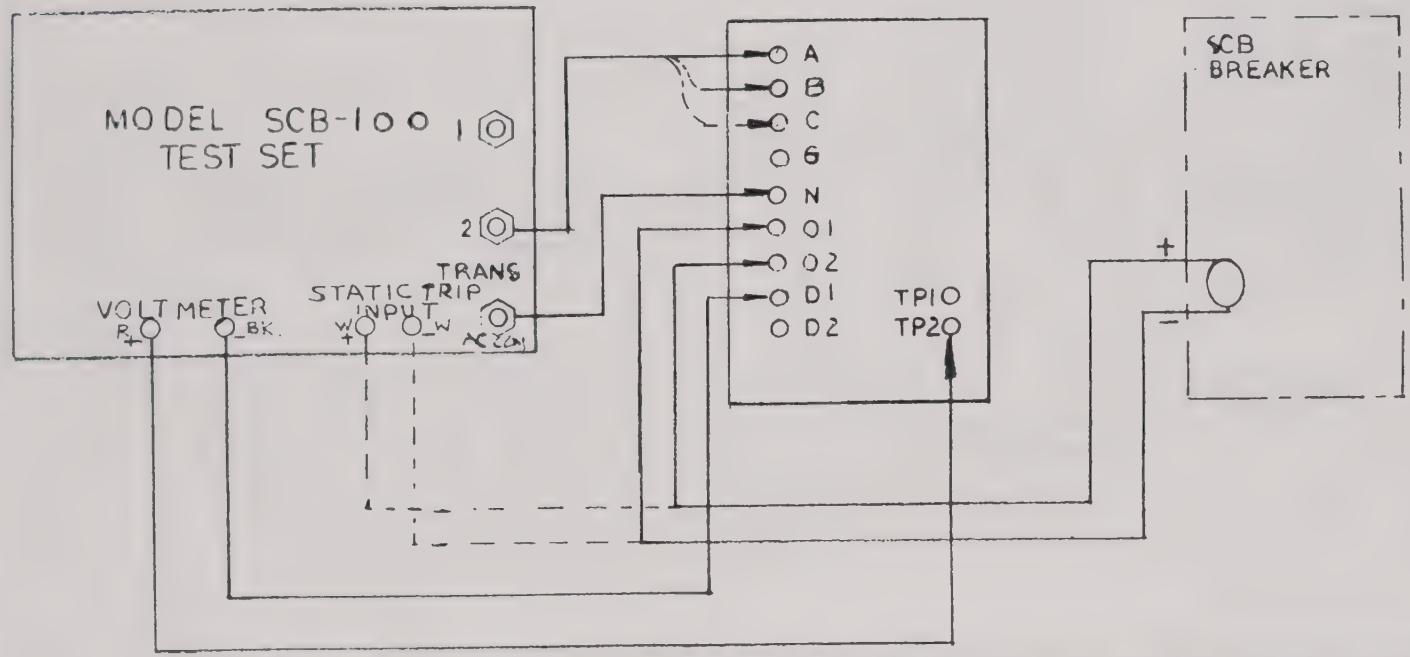
TITLE STATIC TRIP I FIG. 1
TEST CONNECTION DIAGRAM SCB 100

PART NO.	DWG. NO.	REV
	25169A	0

DWG. NO.			25171A
REVISIONS			
REV	ECN	DATE	REMARKS

TEST CONNECTION DIAGRAM

FIG. 2



TOLERANCES UNLESS NOTED	
3 PLACE DEC.	± .005
2 PLACE DEC.	± .02
FRACTIONS	± 1/32
HOLES THRU 1/2" DIA.	+.004 -.000
ANGLES	±0° 30'

THE DEVICE DEPICTED AND DESCRIBED HEREON EMBODIES PROPRIETARY DESIGN OWNED BY MULTI-AMP CORP. ALL DESIGN MANUFACTURING, REPRODUCTION, SALES AND PATENT RIGHTS REGARDING THIS DEVICE OR DRAWING ARE RESERVED, EXCEPT WHERE EXPLICIT RIGHT IS GRANTED IN WRITING

multi-amp
(214) 333-3201
4271 BRONZE WAY DALLAS, TEXAS 75237

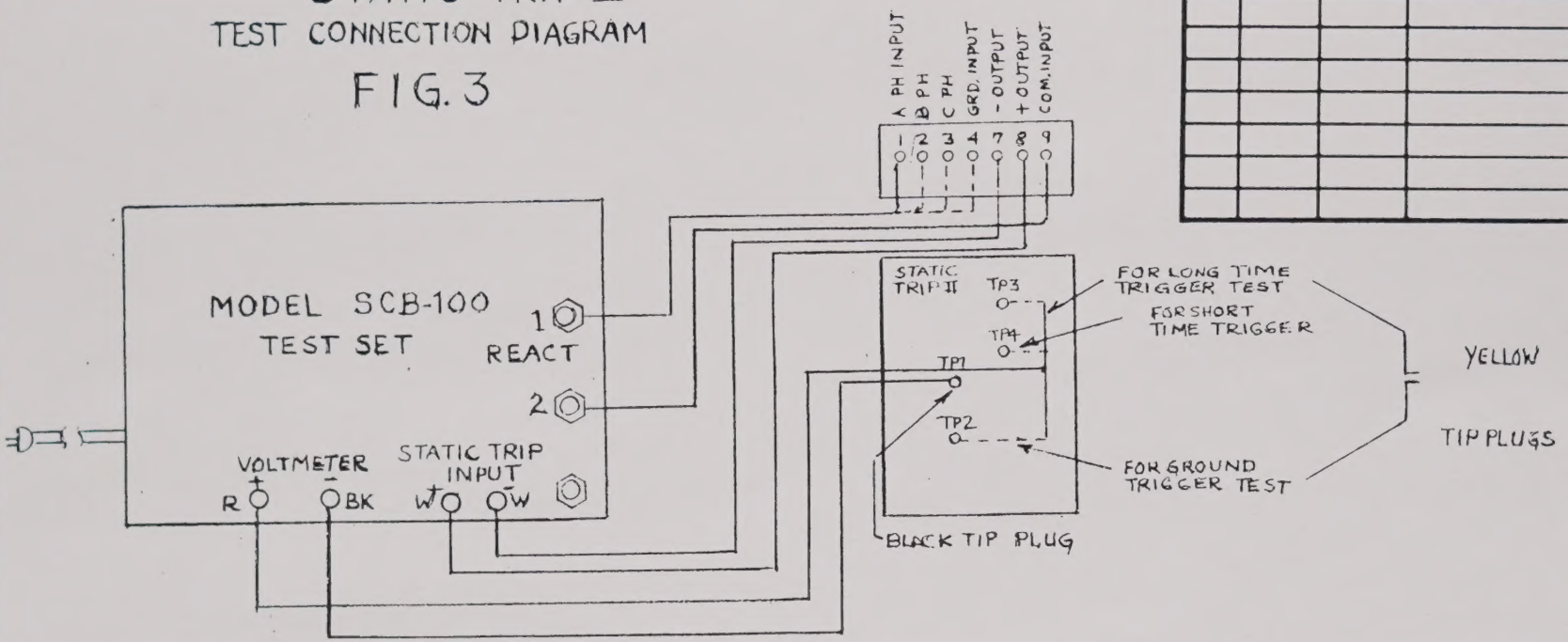
DWN. EIL	APPD. Paul Pa...	SCALE NJ
CHKD. [illegible]	DATE 12-2-83	SH. 1 OF 1

TITLE FIG. 2
TEST CONNECTION DIAGRAM SCB100

PART NO.	DWG. NO.	REV
	25171A	0

STATIC TRIP II
TEST CONNECTION DIAGRAM
FIG. 3

DWG. NO.	25170A		
REVISIONS			
REV	ECN	DATE	REMARKS



TOLERANCES UNLESS NOTED	
3 PLACE DEC.	± .005
2 PLACE DEC.	± .02
FRACTIONS	± 1/32
HOLES THRU 1/2" DIA.	+.004 -.000
ANGLES	±0° 30'

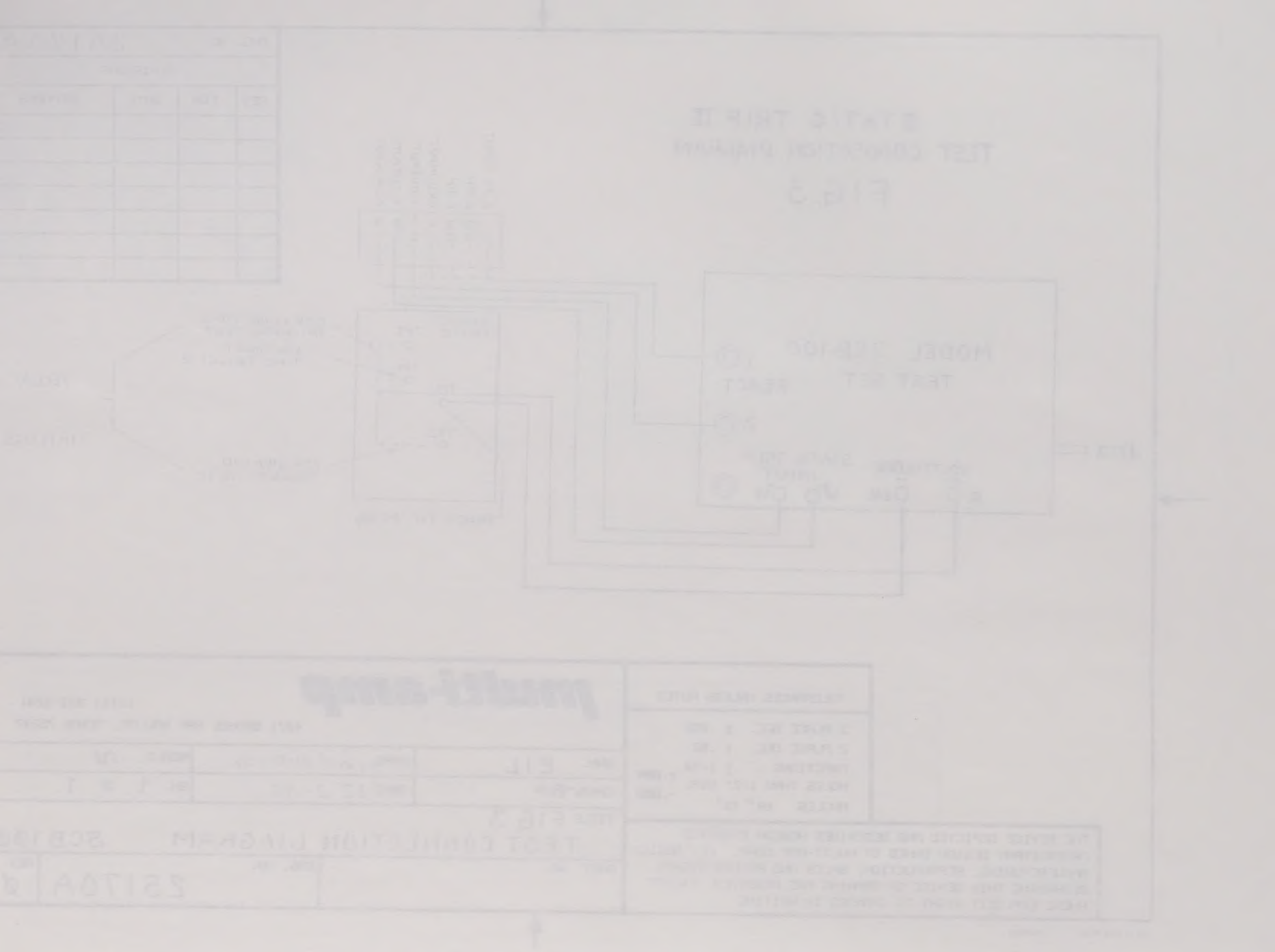
THE DEVICE DEPICTED AND DESCRIBED HEREON EMBODIES PROPRIETARY DESIGN OWNED BY MULTI-AMP CORP. ALL DESIGN MANUFACTURING, REPRODUCTION, SALES AND PATENT RIGHTS REGARDING THIS DEVICE OR DRAWING ARE RESERVED, EXCEPT WHERE EXPLICIT RIGHT IS GRANTED IN WRITING

multi-amp
(214) 333-3201
4271 BRONZE WAY DALLAS, TEXAS 75237

DWN. EIL	APPD. [illegible]	SCALE NONE
CHKD. [illegible]	DATE 12-2-93	SH. 1 OF 1

TITLE FIG. 3
TEST CONNECTION DIAGRAM SCB100

PART NO.	DWG. NO.	REV
	25170A	Ø



www.manualsplus.com
1000071